LongView

**MEMORANDUM**

**Date:** **August 25, 2003**

**To:** **Dean Grover, U.S. Forest Service Region 6**

**From:** **Steve Padula, Long View Associates (LVA); Emily Andersen, LVA**

**Subject:** **Ramping Rates**

LVA has completed its research on ramping rate conditions as part of a FERC license and/or settlement agreement relating to a relicensing process (see attached summary table). Our research was based on a review of hydropower projects 50+ MW in size that have been granted or are awaiting the issuance of a new license by FERC since 1994. In addition to reviewing the issued license, we reviewed the FERC-issued NEPA document and settlement agreement (where applicable) to complete this exercise.

Pursuant to the USFS scope of work, the attached summary table includes the following information:

- Location of project (river and state), size of project (MW) and length of license term and the date license was issued.
- Ramping rate in inches/hr (also cfs/hr if available).
- Rationale for establishing a ramping rate (recreation, bank protection, fish resource protection, etc.). If for fish protection identify species and life stage(s) if available.
- Schedule of ramping rate (by month or season) and rationale for schedule.

In summary, of the 35 projects[1] in our database, 22 have established ramping rate regimes. For a number of these 22 project complexes, there are multiple developments/dams/bypass reaches. Accordingly, in the summary table we have identified the number of facilities for each project and which facility is assigned a ramping rate regime. We found that for sixty four (64) of the 109 developments/dams/bypass reaches (59%) that comprise the 22 project complexes (or of the 174 total developments/dams/bypass reaches (37%) that comprise the 35 projects reviewed), a ramping rate regime has been established.

Please let us know if you have any questions or need additional information. Thank you.

Enclosures

**RAMPING RATES AS CONDITIONS OF A FERC LICENSE AND/OR SETTLEMENT AGREEMENT - REVIEW OF 50+ MW PROJECTS RELICENSED[1] SINCE 1994 (ORGANIZED FROM NEWEST TO OLDEST LICENSES)**

| Project | Location (river and state) | Size (MW) | Project/development with ramping rate requirement | Ramping rate(s) | Schedule (monthly, seasonal) | Rationale for ramping rates and associated schedule |
|---|---|---|---|---|---|---|
| 1. Pit No. 1 (2687)<br>1 development<br>*40-yr license issued 03/19/03* | Fall and Pit rivers, CA | 69.3 | NA | Generator loading rate: 2 MW/min; unloading rate: 0.5 MW/min | None specified | To reduce impacts (i.e., stranding) of flow fluctuations downstream of powerhouse on aquatic habitat.<br><br>Fish assemblage located downstream of Project dominated by rainbow trout, Sacramento [redacted] [2] |

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|---|---|---|---|---|---|---|---|
| 6. Cowlitz River (2016)<br>2 developments<br>*5-yr license issued 03/13/02* | Cowlitz River, WA | 462.0 | Mayfield Dam (most downstream) | Daylight<br>No ramping<br>1 in/hr<br>2/ in/hr | Night<br>2 in/hr<br>1 in/hr<br>2/ in/hr | Feb 16 – June 15<br>June 16 – Oct 31<br>Nov 1 – Feb 15<br><br>Applied to flows < 6,000 cfs | To protect fish from stranding.<br><br>The dominate fish species found downstream of the Mayfield Dam include spring and fall chinook salmon, coho salmon, chum salmon, winter and summer steelhead trout, sea-run cutthroat trout, white sturgeon, pacific lamprey, and Columbia River smelt.<br><br>The schedule is based on the Washington Department of Fish and Wildlife's (WDFW's) criteria that were designed to mimic natural river conditions (Hunter 1992). The February 16-June 15 criterion is established for salmon fry and the June 16-October 31 criterion is established for steelhead and trout fry. |
| Notes:<br>Licensee had voluntarily been instituting this ramping rate schedule for the 10 years prior to receiving a new license.<br><br>Daylight is defined as one hour before sunrise to one hour after sunset, and night is defined as one hour after sunset to one hour before sunrise. | | | | | | | |
| 7. Raquette River: Carry Falls (2060), Upper (2084), Middle (2320), Lower (2330)<br>4 projects; 14 developments<br>*32-yr license(s) issued 02/13/02* | Raquette River, NY | 161.5 | Middle Raquette River Project; 3 of 4 developments (Colton, Hannawa, and Sugar Island) | See Notes | | See Notes | Scheduled whitewater boating releases are to be based upon a ramping schedule. |
| Notes: Per the settlement agreement: "The licensee shall be required to incorporate flow ramping when ascending to, or descending from, the desired peaks of any scheduled release. Energy losses associated with ramping flows shall be included as part of the whitewater budget. The licensee, at its own discretion, shall provide ramping utilizing turbine operations, gate releases, or a combination of both. Within the Colton, Hannawa, and Sugar Island bypass reaches, instream flows are being provided (see Section 3.3.3). The instream flow required at the prevailing time of year at each development will serve as the starting point of ramping up to the whitewater peak flow. The basic ramping scheme adopts an hourly doubling of the flow when ascending to the peak flow and an hourly halving of the flow when descending from the peak flow. These ratios are approximate since they are subject to equipment limitations." | | | | | | | |

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|---|---|---|---|---|---|---|---|
| 8. Rock Creek-Cresta (1962)<br>2 developments<br>*33-yr license issued 10/24/01* | North Fork Feather River, CA | 196.0 | Rock Creek and Cresta developments | Up-<br>East Branch Feather rate (see notes)<br><br>300/400 cfs/hr (see notes)<br><br>400 cfs/hr | Down-<br>East Branch Feather rate (see notes)<br><br>150 cfs/hr<br><br>150 cfs/hr | Mar – May<br><br>June<br><br>July - Feb | The licensee and the other signatories to a settlement agreement developed ramping rate criteria with the objective of matching the more natural flow changes that occur in the unregulated East Branch NFFR to allow fish to adjust to changing river conditions and protect aquatic resources from the effects of rapid and frequent flow changes by limiting excessive scouring of spawning gravels and preventing the stranding of trout fry.<br><br>Rainbow trout, brown trout, Sacramento sucker, Sacramento pikeminnow, hardhead, sculpin, and occasionally smallmouth bass, carp, pond smelt, wakasagi, and bluegill are found in the Project area. |
| Notes: Rise and fall of E. Branch Feather rate to be achieved by holding Rock Creek PHs constant during pulse (unless RCPH decreased to maintain flow > target pulse). Pulse event can be terminated when EBF flow is constant (±100 cfs/hr), at which time normal operations resume, and spill may be reduced at 150 cfs/hr. Same rise and fall ramping limitations apply to non-pulse spill events past diversion dam between March and first 2 weeks of June. 300 cfs/hr rise during first 2 weeks of June, 400 cfs/hr rise for second 2 weeks of June if spill is from operations. No ramping rates would be imposed for operation when uncontrolled spill flows would be above 3,000 cfs. | | | | | | | |

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|---|---|---|---|---|---|---|---|
| 9. Mokelumne River (137)<br>11 developments<br>(4 hydro; 7 storage)<br>*30-yr license issued 10/11/01* | Mokelumne, North Fork Mokelumne and Bear rivers, CA | 215.0 | N. Fork Mokelumne | Up<br>25%/hr[3]<br><br><br><br>25 cfs/hr | Down<br>20%/hr > 300 cfs;<br>25 cfs/hr , < 300 cfs<br>50%/day diff between initial and target flows 4 steps/day < 250 cfs;<br>50%/day diff between initial and target flows 4 steps/day > 250 cfs | Nov 1 – June 15<br><br><br><br>June 16 – Oct 31 | The proposed pulse flows based on the unimpaired hydrograph, in combination with the proposed ramping rates, would allow the removal of fine sediments and silt from stream channels and would replenish sediments and gravels in the downstream reaches.<br><br>The ramping rates would continue to provide navigable flows in all whitewater runs for approximately 1-2 hours before and after the scheduled release period. Also, the ramping rates would extend the length of time that each run is navigable during each scheduled release, and reduce the likelihood of stranding boaters mid-run. |
| | | | Bear River below L. Bear River Reservoir | 25%/hr<br><br><br><br>25 cfs/hr | 20%/hr > 300 cfs;<br>25 cfs/hr < 300 cfs<br>50%/day of diff between initial and target flows 4 steps/day | Nov 1 – May 31 (or after spill stops if later than 5/31)<br><br>June 1 – Oct 31 (or after spill stops if later than June 1) | |

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|---|---|---|---|---|---|---|---|
| | | | Cole Creek below Bear River Tunnel Diversion | 50%/hr<br><br><br><br>25 cfs/hr | 20%/hr > 200 cfs;<br>25 cfs/hr , < 200 cfs<br>50%/day of diff between initial and target flows 4 steps/day | Nov 1 – May 31<br><br><br><br>June 1 – Oct 31 | |
| | | | Blue and Meadow creeks | 25%/hr<br>15 cfs/hr | 10 cfs/hr<br>5 cfs/hr | Nov 1 – May 31<br>June 1 – Oct 31 | |
| | | | Tiger Creek below Tiger Creek Regulator Dam | 5 cfs/hr<br>5 cfs/hr | 5 cfs/hr<br>2 cfs/hr | Nov 1 – May 31<br>June 1 – Oct 31 | |
| 10. Haas-Kings River (1988)<br>2 developments<br>*40-yr license issued 03/06/01* | North Fork Kings River, CA | 193.1 | None | -- | | -- | -- |
| 11. Michigamme (1759)<br>8 projects; 10 dams<br>*40-yr license issued 01/12/01* | Menominee, Paint and Michigamme rivers, WI/MI | 61.1 | Way Dam Project (most upstream on Michigamme) | Flows shall not change more than 20% in any 2-hr period or more than 50% in any 24-hr period with some exceptions (see Notes) | | None specified | Increased minimum flows and restrictions to flow changes generally stabilize the quantity of water and reduce the fluctuation in riverine sections between the Way Dam Project and Peavy Pond. |

Notes: Ramping restrictions do not apply if: 1) natural changes to project inflows occur that exceed the specified ramping rates; 2) the Michigamme Reservoir elevation is between 1,373.8 and

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| 12. Missouri-Madison (2188)<br>9 developments<br>(8 hydro, 1 storage)<br>*40-yr license issued 09/27/00* | Missouri and Madison rivers, MT | 326.9 | Hebgen Development (most upstream on Madison) | < 10%/day change in outflow | | Year round | To reduce potential for erosion at Quake Lake (impoundment above Hebgen Development).<br><br>To reduce the chance of stranding fish and washing fish downstream.<br><br>Species located in the tailwaters and river segments downstream of the developments include rainbow, brown trout, kokanee and mountain whitefish. |
| | | | Madison Development | Up- and downramping rate of 100 cfs/hr | | | |
| | | | Hauser and Holter developments | No more than 5% change from the previous hour's average flow | | | |
| | | | Morony Development (most downstream on Missouri) | No more than 7.5% change from the previous hour's average flow | | | |
| 13. Curtis-Palmer (2609)<br>2 developments<br>*40-yr license issued 04/27/00* | Hudson River, NY | 58.3 | Curtis and Palmer developments | Up- and downramping rate of 1 ft/hr | | None specified | The further limitation of impoundment drawdowns to 1.5 feet for the June 16 – February 28/29, including the specified ramping rate, will provide protection for recreational uses of the impoundment. |
| 14. Clark Fork River (2058)<br>2 developments<br>*45-yr license issued 02/23/00* | Clark Fork River, ID/MT | 697 | None | -- | | -- | -- |
| 15. Cushman (460)<br>2 developments<br>*40-yr license issued 07/30/98* | N. Fork Skokomish River, WA | 131.0 | Dam No. 2 (most downstream) | Daytime<br>0 in/hr<br>1 in/hr<br>2 in/hr | Nighttime<br>2 in/hr<br>1 in/hr<br>2 in/hr | Feb 16 – June 15<br>June 16 – Oct 31<br>Nov 1 – Feb 15 | To minimize impacts to downstream aquatic resources.<br><br>Fish populations below Dam No. 2 include chinook, coho, and chum salmon, and steelhead and sea-run cutthroat trout.<br><br>See Cowlitz River Project above for explanation of schedule. |
| Notes: Until critical flows (i.e., flows released from the project for which the site-specific ramping rates should be implemented) have been determined, the Licensee is to operate the project to meet the general ramping rates outlined above. | | | | | | | |
| 16. Kingsley (1417)<br>29 dams (4 hydro)<br>*40-yr license issued 07/29/98* | N. Platte and Platte rivers, NE | 105.9 | None (see Notes) | -- | | -- | -- |
| Notes: There is no indication in the license that ramping rates were a requirement; however, the FEIS is not available through FERC's on-line database, so we could not confirm this point. | | | | | | | |
| 17. Wyman (2329)<br>1 development<br>*40-yr license issued 11/25/97* | Kennebec River, ME | 72.0 | None | -- | | -- | -- |

| Project | Location | Size | Project/development with ramping rate | | Schedule (monthly | Rationale f |
|---|---|---|---|---|---|---|

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|---|---|---|---|---|---|---|
| 22 St. Louis River (2360) | St. Louis | 88.6 | Whiteface Reservoir | 0-50 cfs flows | None specified | To protect fish |

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|---|---|---|---|---|---|---|---|
| 23. Skagit River (553)<br>3 developments<br>*30-yr license issued 05/16/95* | Skagit River, WA | 689.4 | Gorge Development (most downstream) | Daytime (down)<br>*Salmon*<br>< 4,700 cfs, none<br>> 4,700 cfs 1,500 cfs/hr | Nighttime (down-)<br>*Salmon*<br>3,000 cfs/hr | During salmon and steelhead fry protection period (June 1 – Oct 15 for steelhead) | Salmon and steelhead fry protection downstream of development. |
| | | | | *Steelhead*<br>< 4,000 cfs, 500 cfs/hr<br>> 4,000 cfs 500 cfs/hr | | | |
| 24. Lynn Lake (2459)<br>1 development<br>*30-yr license issued 12/27/94* | Cheat River, WV/PA | 51.2 | None | -- | | -- | -- |
| 25. Walters (432)<br>1 development<br>*40-yr license issued 11/04/94* | Pigeon River, NC | 108 | None | -- | | -- | -- |
| [illegible] | [illegible] | 133.7 | All projects | Maintenance ramping for [illegible] | | None specified | [illegible] |

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|---|---|---|---|---|---|---|
| 27. North Umpqua (1927) 8 developments | North Umpqua River, OR | 185.5 | Bypassed reaches (all developments) and | 0.5 ft/hr for year 1 of new license and | None specified | To protect steelhead and salmon fry. |

| | Location | Size | Project/development with ramping rate | | Schedule (monthly | Rationale for ramping rates |
|---|---|---|---|---|---|---|
| [redacted] | | | | | | |

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|---|---|---|---|---|---|---|
| 33. Box Canyon (2042)<br>1 development<br>*New license not issued to date; current license expired 01/31/02* | Pend Oreille River, ID/WA | 60.0 | NA | 3 in/hr at flows < 90,000 cfs | None specified | To reduce erosion downstream of the project. |
| Notes: FERC has yet to issue a license, but according to FERC's DEIS, the Licensee has proposed the ramping regime outlined above, which is consistent with USDI's proposal (under its 4(e) authority). FERC recommends implementation of the proposed regime. | | | | | | |
| 34. Pit No. 3, 4, 5 (233)<br>3 developments; 4 dams<br>*New license not issued to date; current license expires 10/31/03* | Pit River, CA | 325.0 | TBD (see Notes) | Not specified (see Notes) | None specified | To avoid rapid termination of spills when river flows come under control of the Project, which could have the effect of stranding fish.<br><br>Sacramento sucker, hardhead and rainbow trout are the dominant species of the riverine fish communities. |
| Notes: FERC has yet to issue a license, but according to FERC's DEIS, the Licensee has proposed to develop a plan for ramping the tail end of spill flows, which FERC concurs with. | | | | | | |
| 35. St. Lawrence – FDR (2000)<br>4 developments<br>*New license not issued to date; current license expires 10/31/03* | St. Lawrence River, NY | 912.0 | None (see Notes) | -- | -- | -- |
| Notes: FERC has yet to issue a license, but according to FERC's DEIS, there are no ramping rates proposed for the project, though the USDI does recommend the development and implementation of a Water Levels Monitoring and Management Plan (WLMMP) designed to document and assess the individual and combined causes and effects of water level fluctuations on the physical and | | | | | | |